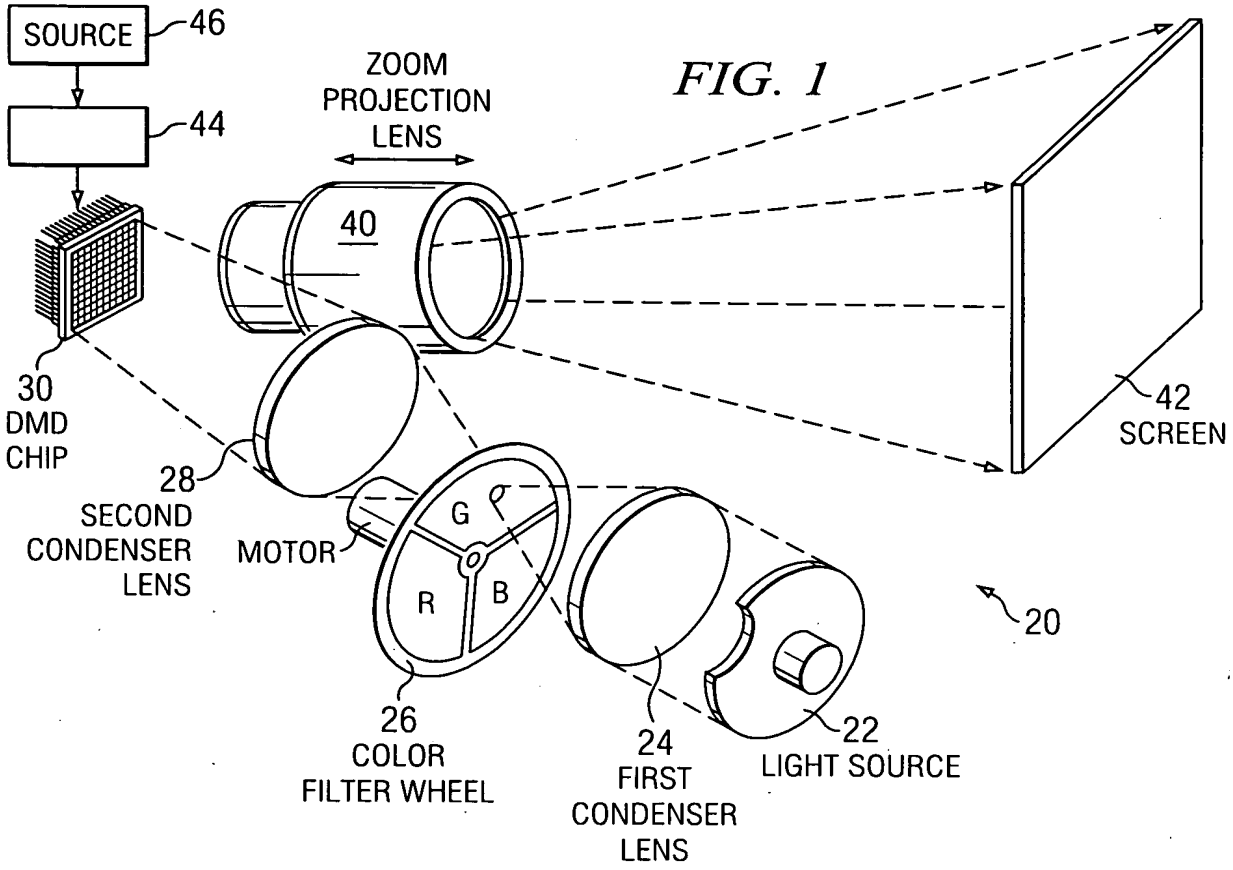


FIG. 1

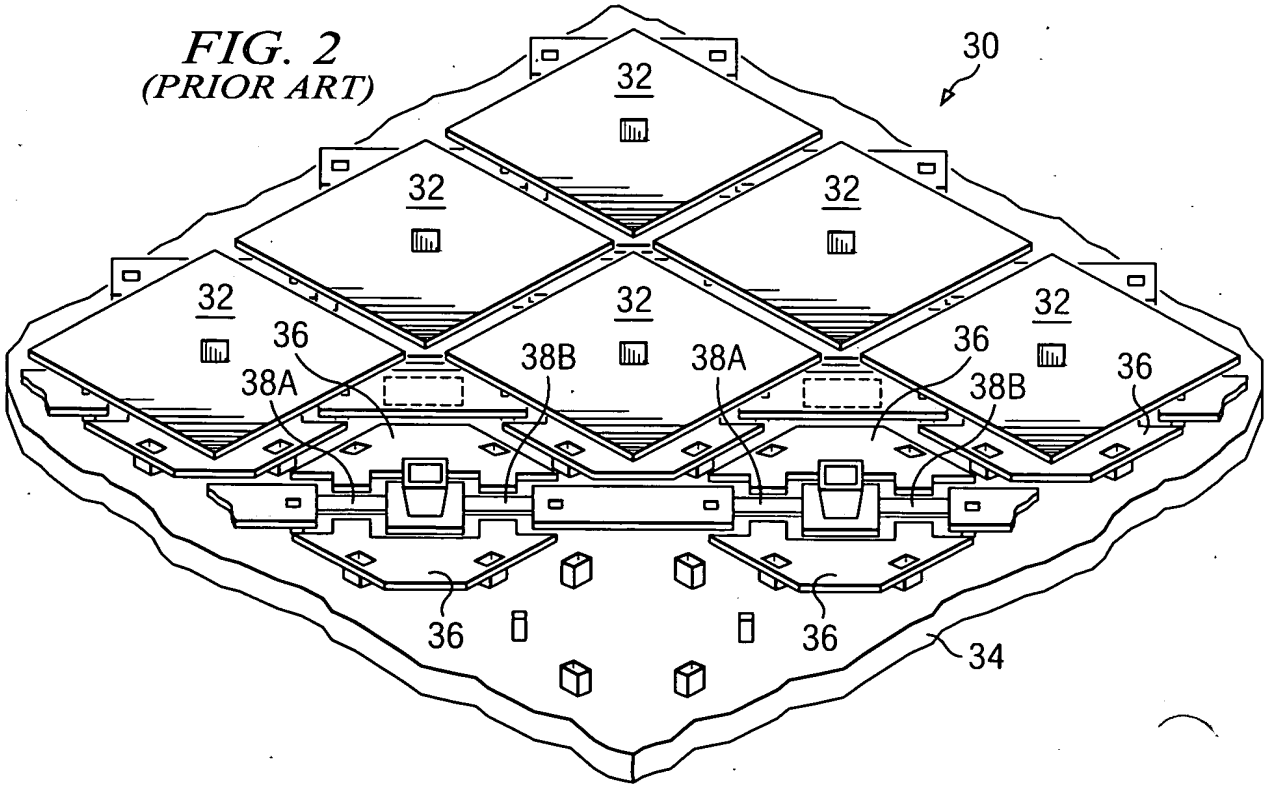


FIG. 2
(PRIOR ART)

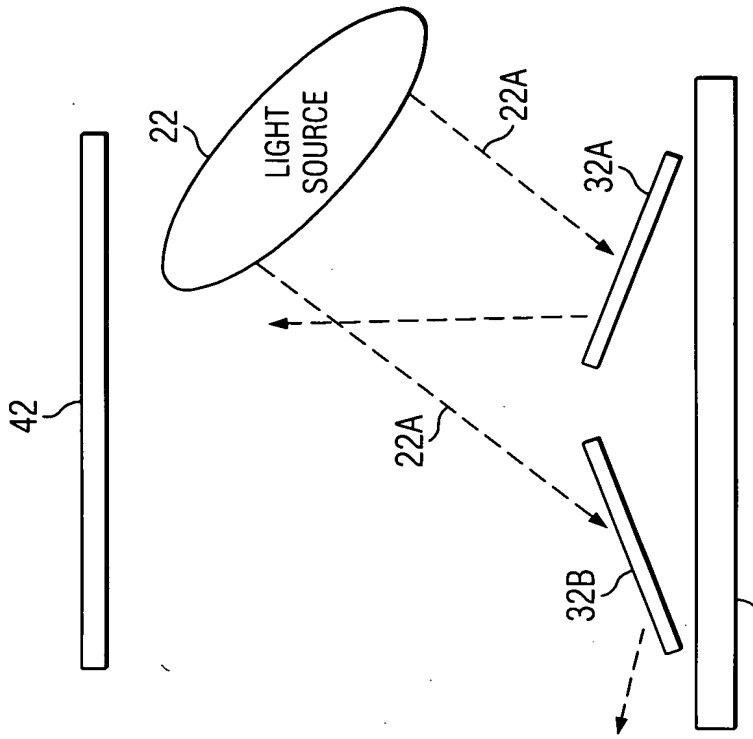
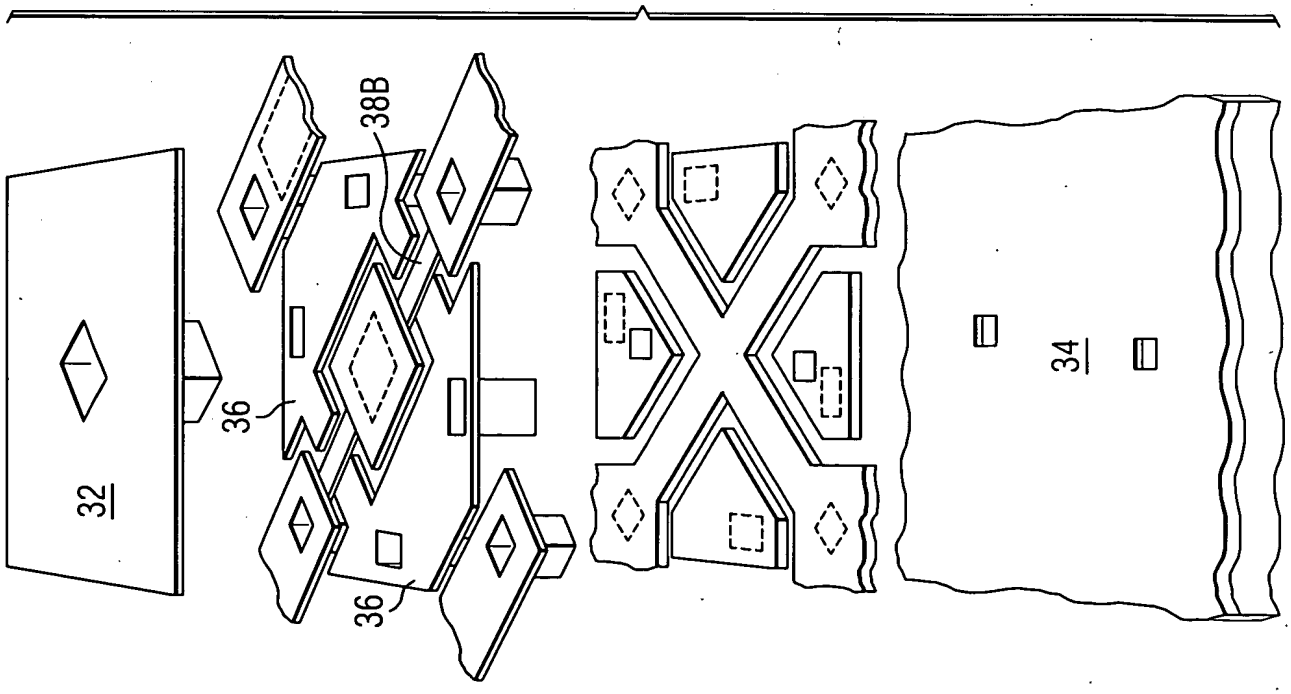


FIG. 4
(PRIOR ART)

FIG. 3



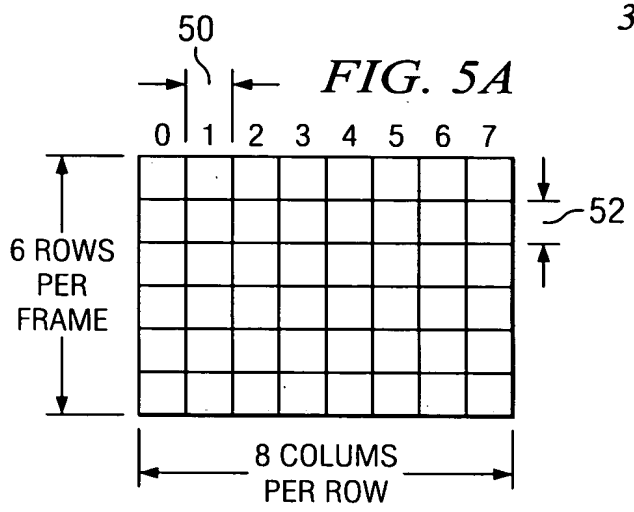


FIG. 5A

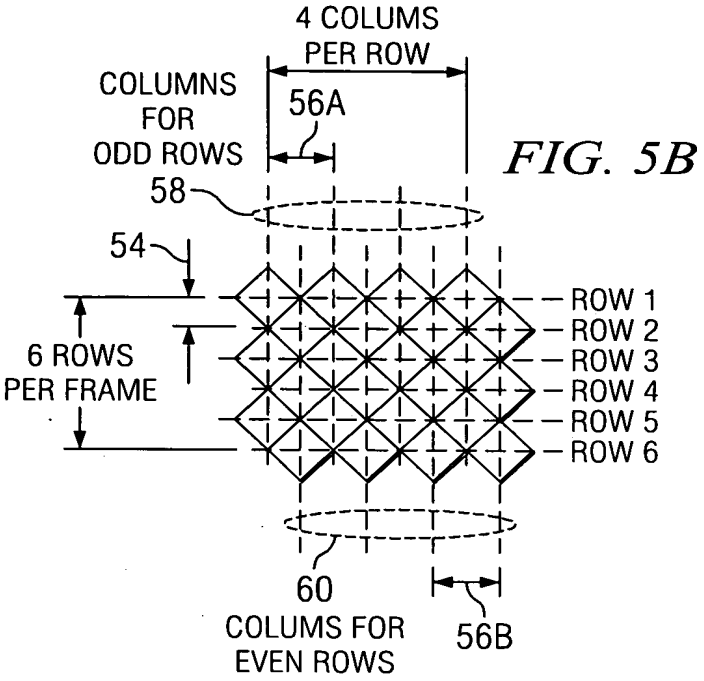


FIG. 5B

FIG. 6

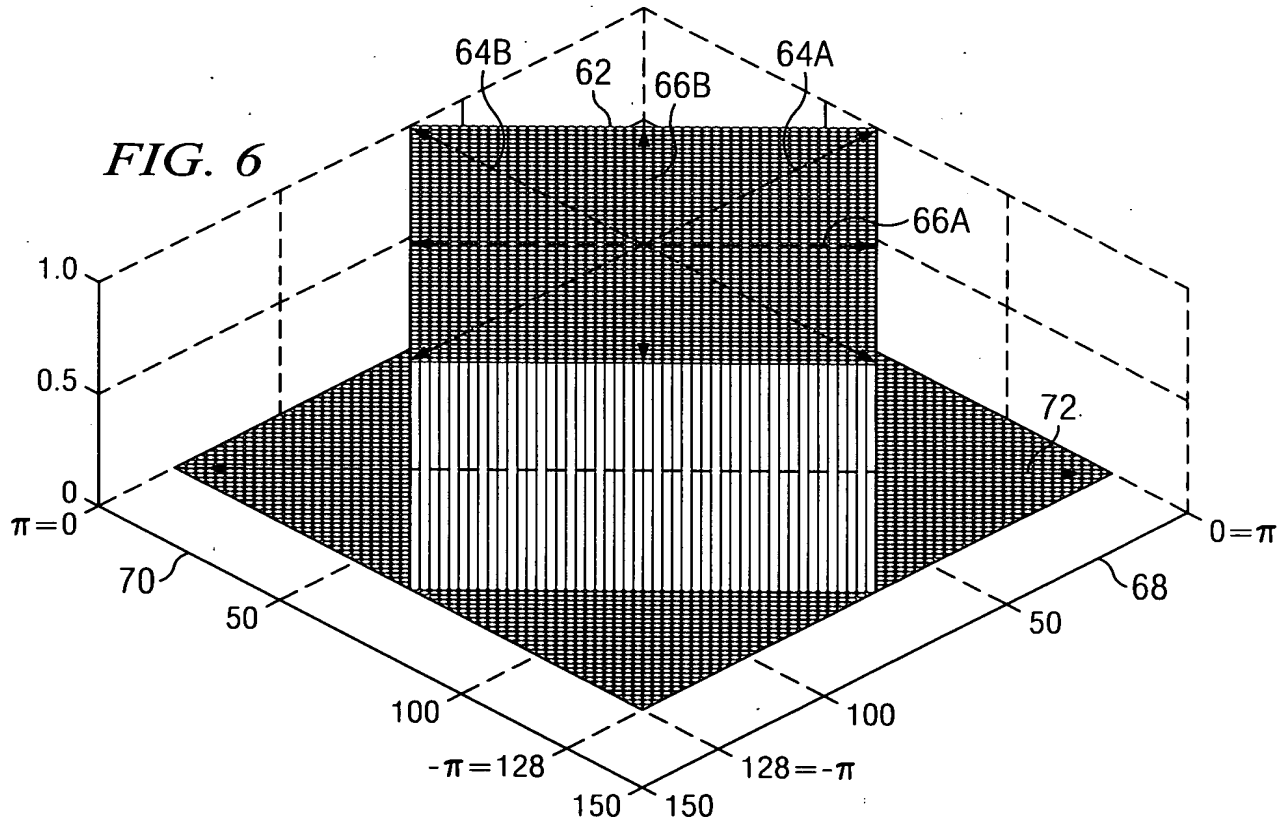


FIG. 7A

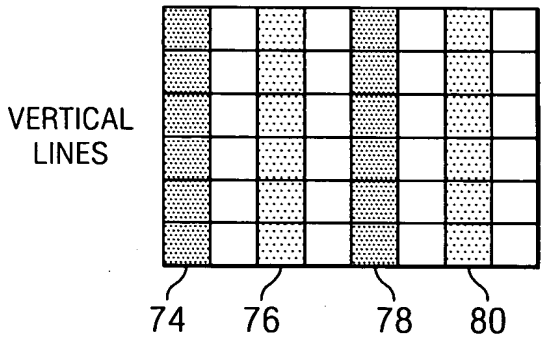


FIG. 7B

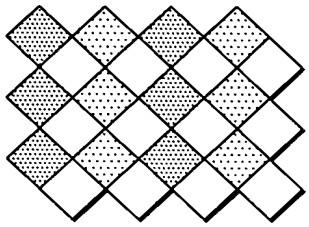


FIG. 8A

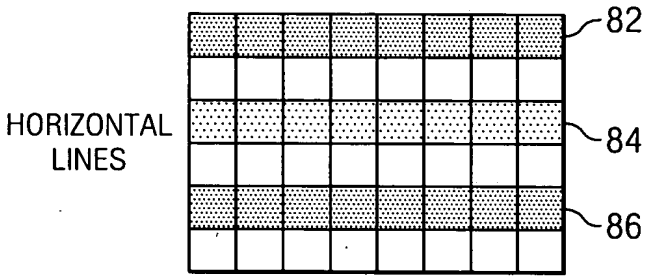


FIG. 8B

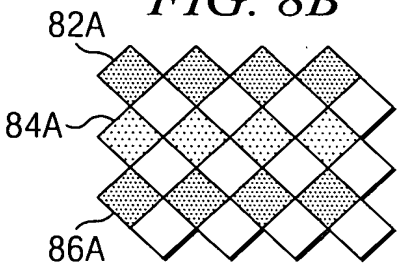


FIG. 9A

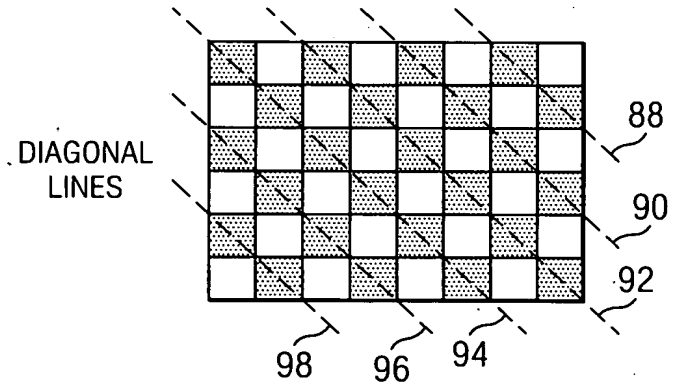


FIG. 9B

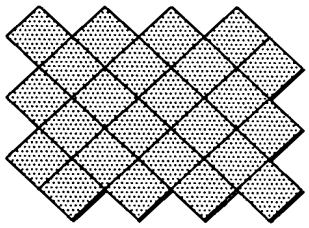


FIG. 10A

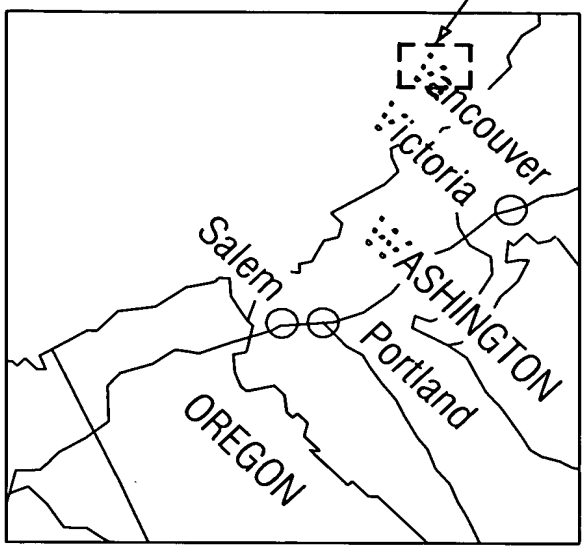


FIG. 10C

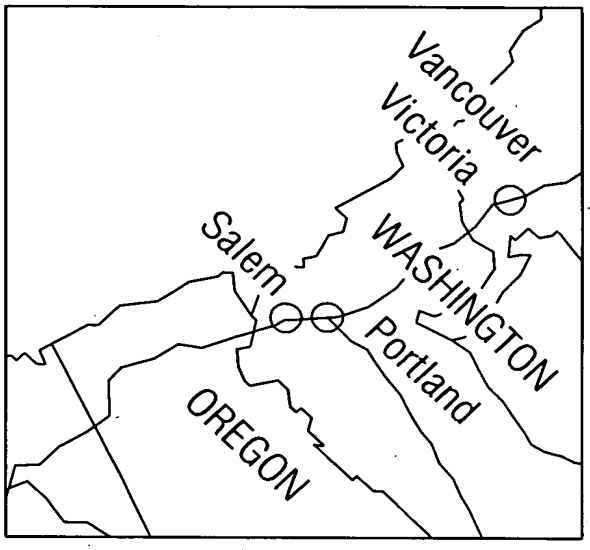


FIG. 10B

FIG. 11A

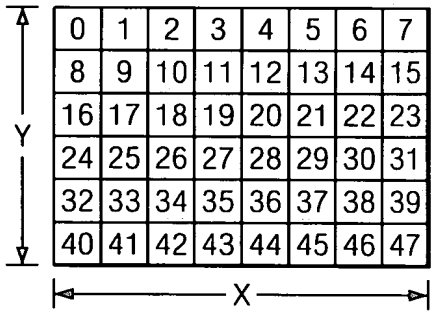


FIG. 11B

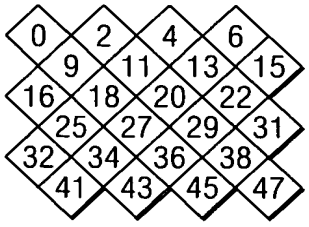


FIG. 11C

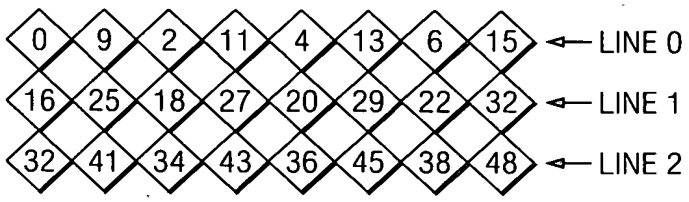
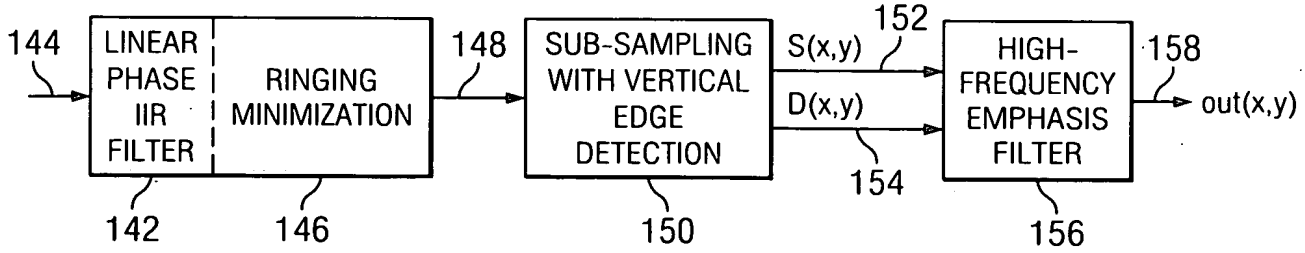


FIG. 12



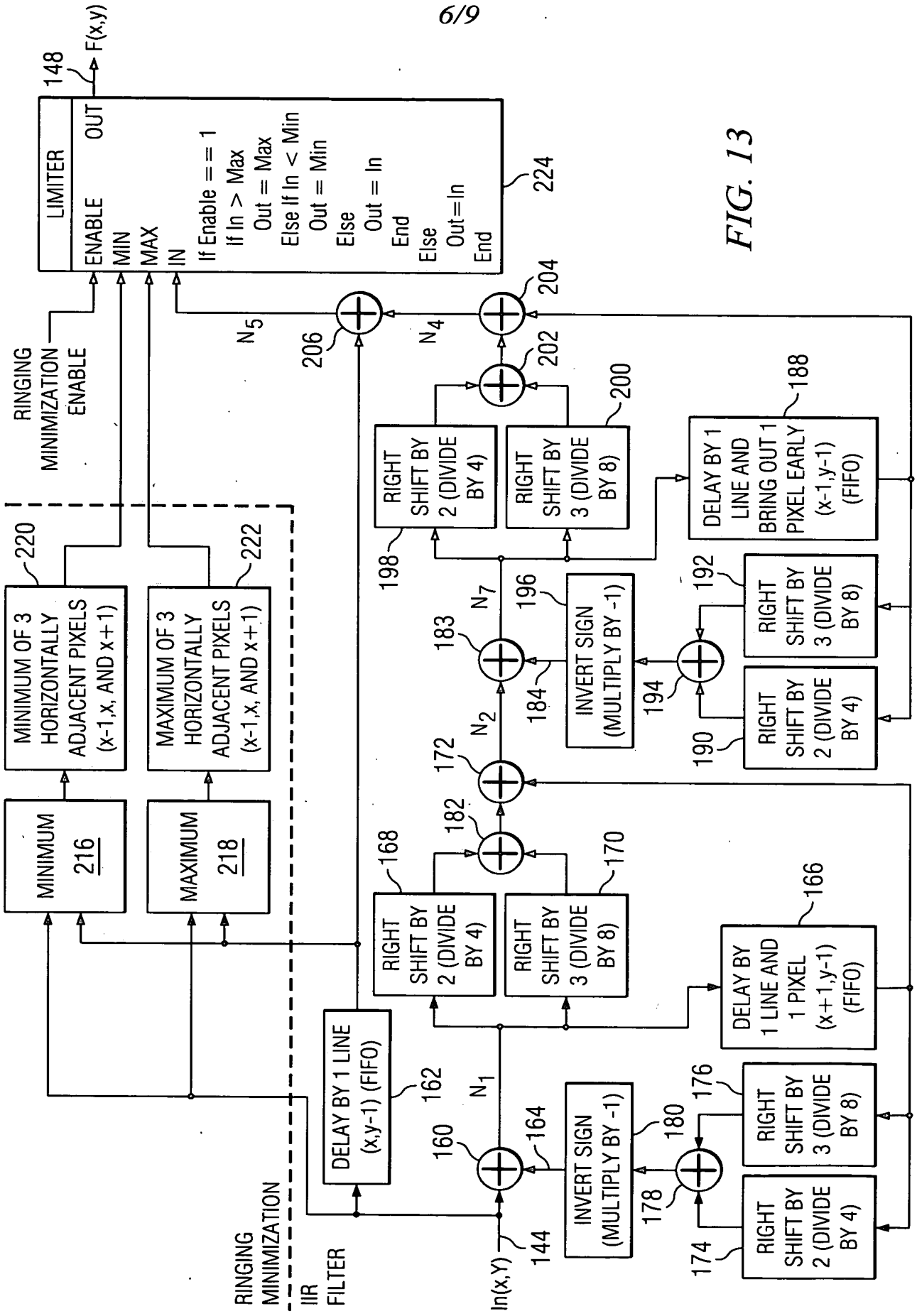

RINGING MINIMIZATION IIR FILTER
In(x,Y)
144
DELAY BY 1 LINE (x,y-1) (FIFO)
162
160
164
INVERT SIGN (MULTIPLY BY -1)
178
180
176
RIGHT SHIFT BY 3 (DIVIDE BY 8)
RIGHT SHIFT BY 2 (DIVIDE BY 4)
174
DELAY BY 1 LINE AND 1 PIXEL (x+1,y-1) (FIFO)
166
RIGHT SHIFT BY 2 (DIVIDE BY 4)
RIGHT SHIFT BY 3 (DIVIDE BY 8)
168
170
182
172
INVERT SIGN (MULTIPLY BY -1)
184
194
196
RIGHT SHIFT BY 3 (DIVIDE BY 8)
RIGHT SHIFT BY 2 (DIVIDE BY 4)
190
192
DELAY BY 1 LINE AND BRING OUT 1 PIXEL EARLY (x-1,y-1) (FIFO)
188
RIGHT SHIFT BY 2 (DIVIDE BY 4)
RIGHT SHIFT BY 3 (DIVIDE BY 8)
198
200
202
204
206
MINIMUM OF 3 HORIZONTALLY ADJACENT PIXELS (x-1,x, AND x+1)
220
MAXIMUM OF 3 HORIZONTALLY ADJACENT PIXELS (x-1,x, AND x+1)
222
MINIMUM 216
MAXIMUM 218
RINGING MINIMIZATION ENABLE
LIMITER
ENABLE
MIN
MAX
IN
OUT
If Enable == 1
If In > Max
Out = Max
Else If In < Min
Out = Min
Else
Out = In
End
Else
Out=In
End
224
148
F(x,y)
N1
N2
N4
N5
N7

FIG. 13

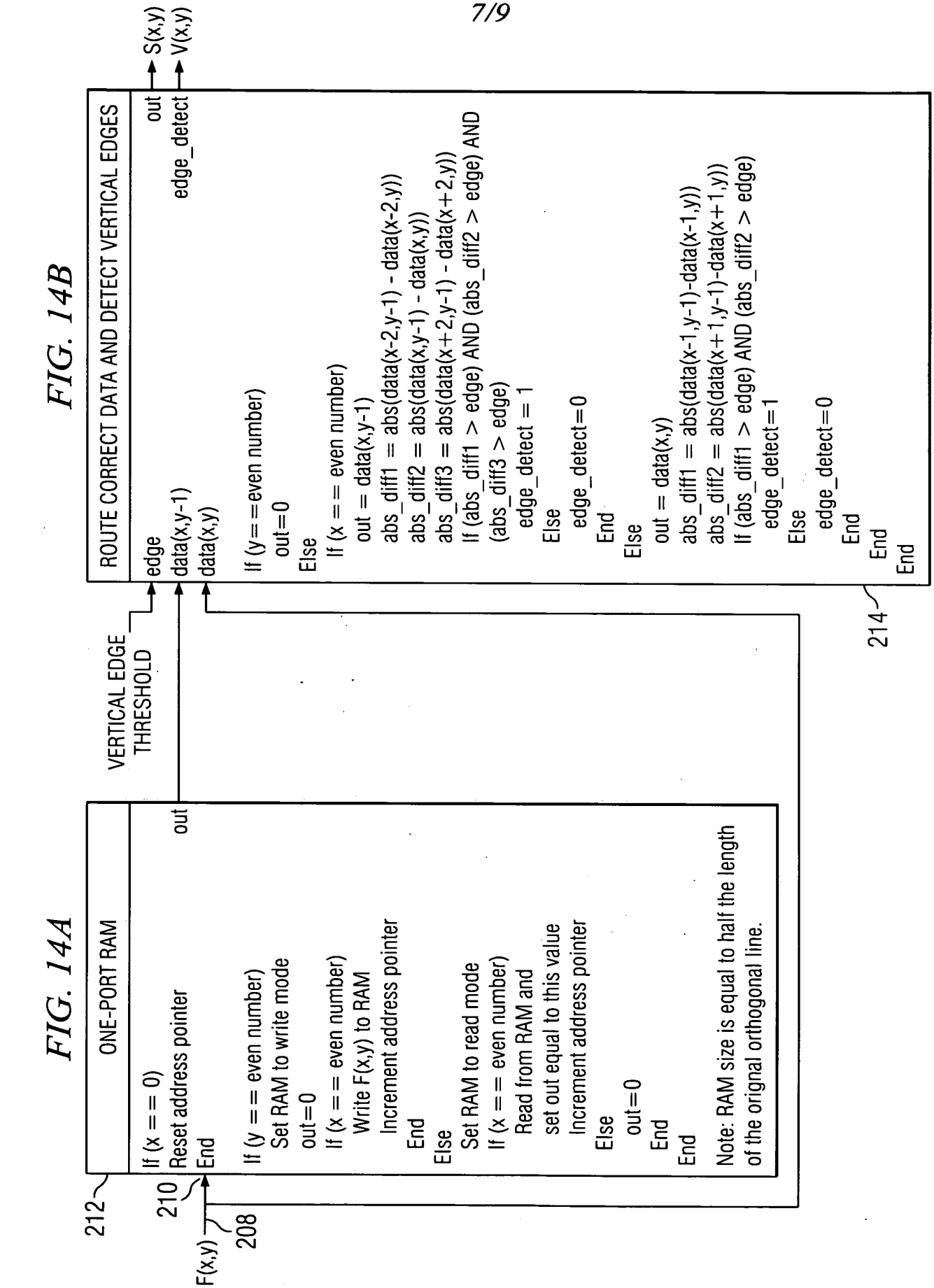


FIG. 14A

FIG. 14B

FIG. 15A

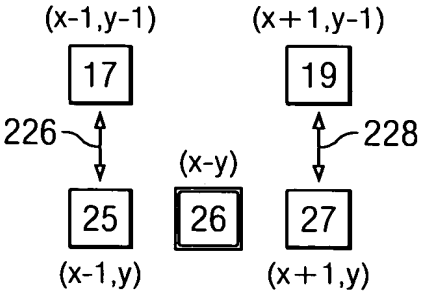


FIG. 15B

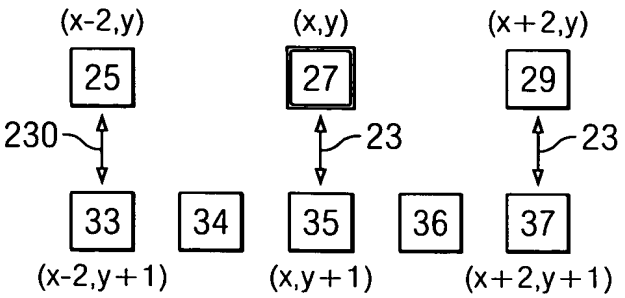


FIG. 16A

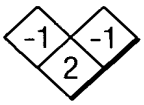


FIG. 16B

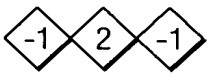


FIG. 17B

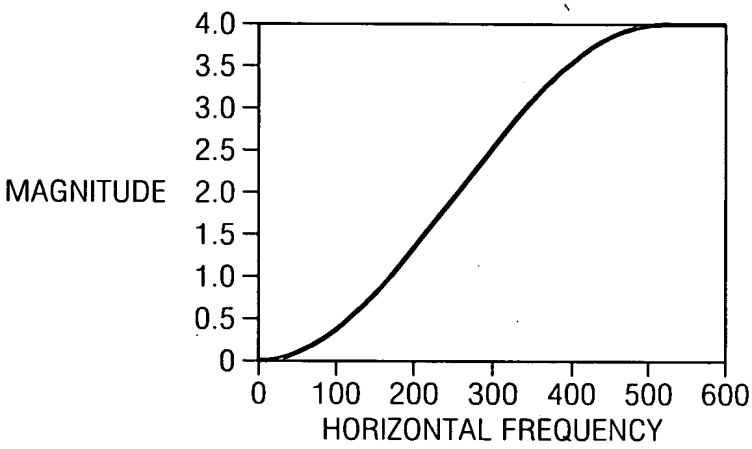
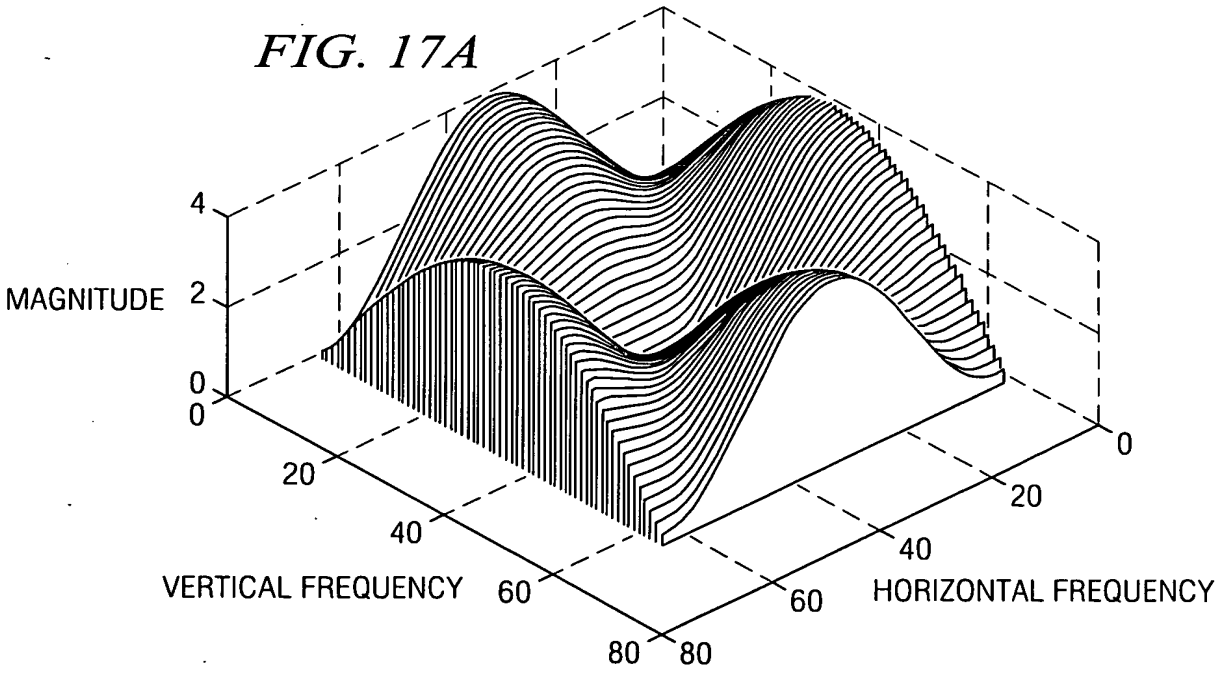


FIG. 17A



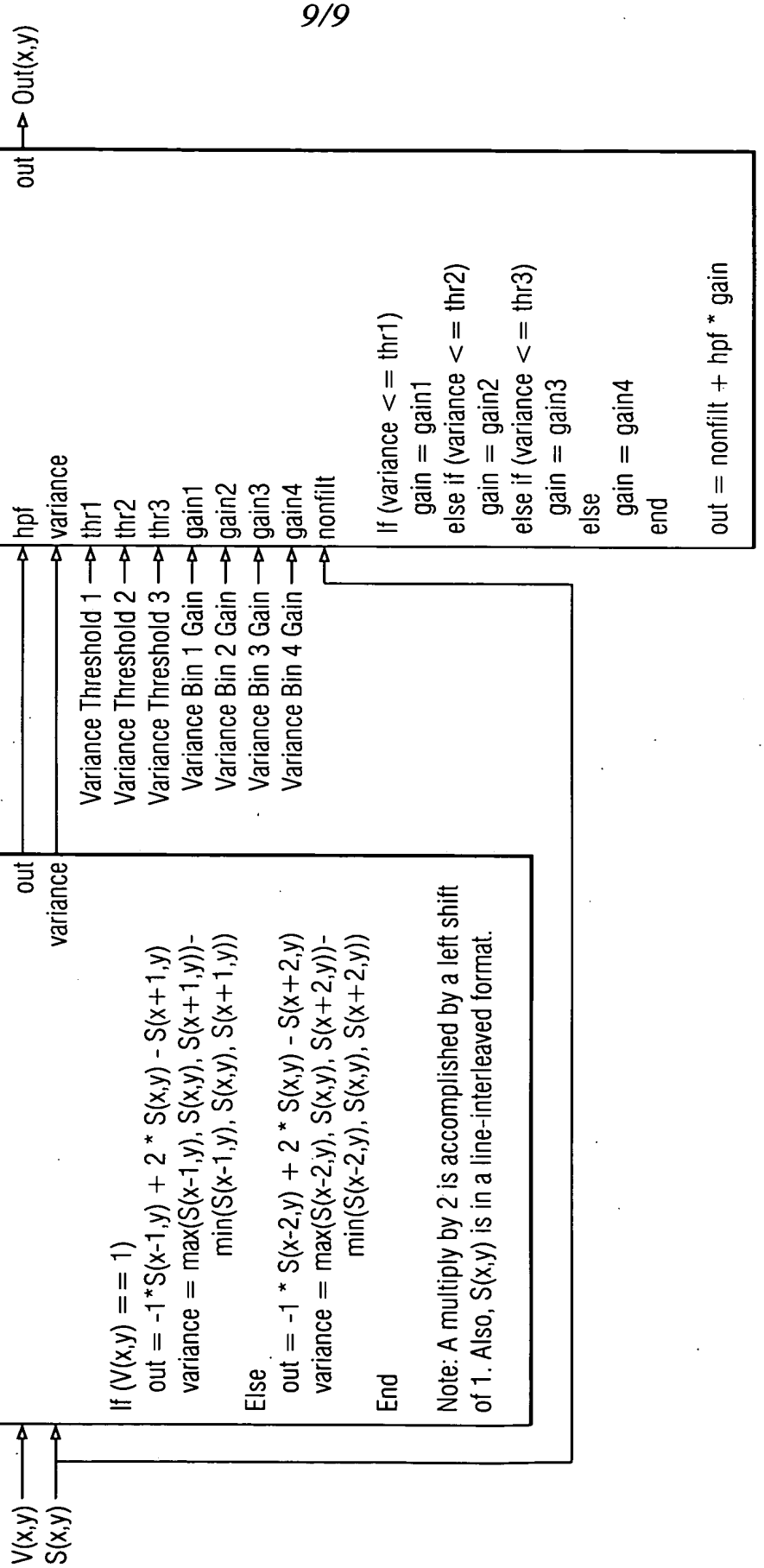

V(x,y)
S(x,y)
HIGH-PASS FILTER
out
variance
If (V(x,y) == 1)
out = -1*S(x-1,y) + 2 * S(x,y) - S(x+1,y)
variance = max(S(x-1,y), S(x,y), S(x+1,y))-
min(S(x-1,y), S(x,y), S(x+1,y))
Else
out = -1 * S(x-2,y) + 2 * S(x,y) - S(x+2,y)
variance = max(S(x-2,y), S(x,y), S(x+2,y))-
min(S(x-2,y), S(x,y), S(x+2,y))
End
Note: A multiply by 2 is accomplished by a left shift
of 1. Also, S(x,y) is in a line-interleaved format.
GAIN ADJUSTMENT
hpf
variance
Variance Threshold 1
Variance Threshold 2
Variance Threshold 3
Variance Bin 1 Gain
Variance Bin 2 Gain
Variance Bin 3 Gain
Variance Bin 4 Gain
nonfilt
out
If (variance <= thr1)
gain = gain1
else if (variance <= thr2)
gain = gain2
else if (variance <= thr3)
gain = gain3
else
gain = gain4
end
out = nonfilt + hpf * gain
Out(x,y)

FIG. 18